

REMARKS

Amendments to the Claims

Claims 1, 3, and 5-12 are pending in the present application and claims 13-20 previously were withdrawn in response to the Examiner's restriction requirement.

Claim 1 has been amended to more clearly define the structure of the claimed invention by clarifying that the catalyst is "capable of" rather than merely "for" catalytic conversion of a hydrocarbon fuel to a hydrogen rich reformat. Support for the amendment may be found throughout the Specification, including at Page 4, Lines 12-14. Claim 12 has been amended into independent form and now includes the limitations of independent claim 1 and intervening dependent claim 11 upon which it depended.

Reconsideration of the present application and allowance of the claims as amended is respectfully requested in view of the following remarks.

Allowable Subject Matter

Claim 12 was objected to as being dependent upon a rejected base claim but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. (Office Action dated April 21, 2009, page 4). The objection is moot in light of the claim amendments. Accordingly, allowance of claim 12 is respectfully requested.

Rejection Under 35 U.S.C. § 102

The Examiner rejected claims 1, 5-7 and 11 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,548,876 to Bregoli (hereinafter "Bregoli"). The rejection is respectfully traversed and is moot in view of Applicants' claim amendments.

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Bregoli discloses a fuel cell requiring a separate external reforming process and comprising a cathode, anode, cathode and anode collectors (interconnects), and corresponding separator plates (current collectors). The fuel cell converts gaseous fuels, typically mixtures of hydrogen and/or carbon monoxide, into energy. (Col. 1, Lines 38-50; Col. 5, Lines 12-23). Bregoli fails, however, to teach each and every element of Applicants' claimed invention.

Specifically, Bregoli fails to teach that the fuel cell has internal reforming capability and that the catalytic coating on the metallic substrate of the anodic interconnect comprises a catalyst capable of reforming hydrocarbon fuel. Bregoli merely discloses that the fuel cell uses an externally reformed feed stream composition "which is typically a mixture of H₂ and/or CO" and "an oxidant gas such as O₂ and CO₂." (Col. 5, Lines 15-16; Col. 4, Lines 44-45). There is no teaching or suggestion that the reforming of the hydrocarbon fuel occurs within the fuel cell itself.

Moreover, Bregoli fails to teach use of a catalyst within the fuel cell itself that is capable of reforming hydrocarbon fuel. Applicants have amended the language to clarify that this limitation is a structural feature, not merely an intended use, and therefore must be considered in examining the claim. Because Bregoli fails to teach each and every element of Applicants' claimed invention, the rejections must be withdrawn.

Furthermore, the claimed invention also is nonobvious over Bregoli because one of ordinary skill in the art would not be inclined to modify Bregoli to obtain Applicants' claimed invention. In fact, doing so would directly contradict the teachings of Bregoli

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that emphasize the use of novel support particles in conjunction with a compacted particulate catalyst, noting that:

There has thus been shown an integrated current collector with *catalyst support* for use in a gaseous fuel cell which provides enhanced gas diffusion and *catalyst support for maintaining separation between the catalyst and the current collector* within the fuel cell. The integrated current collector and *catalyst support* permits the use of compacted particulate electrodes within gaseous fuel cells rather than sintered electrodes, thus providing greater flexibility in the choice of fuel cell materials. The collections of particles within gas diffusion channels may be either nonconductive in maintaining spacing between the catalyst and the current collector or they may be conductive such as a ceramic conductor for providing enhanced current collection also.
(Col. 5, Line 59 – Col. 6, Line 4) (emphasis added).

In light of these teachings, there simply is no reason that one of ordinary skill in the art would be inclined to make all of the required modifications to obtain Applicants' claimed invention. For example, one of ordinary skill in the art would be required to make at least the following modifications to Bregoli: provide a metallic interconnect that does not require the use of separate support particles, provide a catalyst capable of internal reforming on the metallic interconnect in the form of a coating rather than in the form of compacted particles requiring the use of separate support particles, and restrict the coating to select surfaces of the metallic interconnect to maintain electrical conductivity between the metallic interconnect and the current collector while also ensuring that the catalytic reforming reaction occurs sufficiently away from the electrodes to minimize carbonaceous deposit on the surface of the anode. Applicants respectfully submit that making any of these modifications would result in dramatically altering the

fundamental features of the invention of Bregoli. Accordingly, the claimed invention also is non-obvious over the cited art of Bregoli.

Rejection Under 35 U.S.C. § 103

The Examiner rejected claims 1, 3 and 5-11 under 35 U.S.C. § 103(a) as being obvious over U.S. Patent Publication No. 2002/0197518 to Blanchet et al. (hereinafter “Blanchet”). The rejection is respectfully traversed.

Blanchet discloses corrugated current collector supports for internal reforming fuel cells. The corrugations in the rows establish successive peak and valley regions in a given row. Blanchet further describes use of a solid catalyst element disposed within the passages defined by the corrugations. Blanchet does not, however, remotely teach or suggest that the catalyst should be applied selectively as a coating on the metallic substrate of the anodic interconnect.

Although the Examiner recognizes the failures of Blanchet, the Examiner suggests that “one of skill would have found coating the reforming catalyst obvious in view of the teaching by Blanchet of having reforming catalyst elements.” (Office Action at Page 3). The Examiner further asserts that Blanchet applies the reforming catalyst at a position “identical” to the present invention and that Applicant has failed to show any criticality to providing the reforming catalyst as a coating versus a solid catalyst element. (Id. at 3-4). The Examiner, however, is wrong on each point.

First, the Examiner fails to provide anything other than a conclusory explanation for why one of ordinary skill in the art would modify the solid catalyst elements of Blanchet to the catalytic coating of Applicants’ claimed invention, despite the well

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established principle that a *prima facie* case of obviousness requires more than just conclusory statements. “[R]ejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” (KSR International Co. v. Teleflex Inc., 550 U.S. at ____ (2007)).

Second, the purported articulated reasoning and rational underpinning set forth by the Examiner is erroneous. Contrary to the Examiner’s suggestion, the reforming catalyst in Blanchet is not at a position “identical” to the present invention. The solid catalyst element of Blanchet is disposed only in the “through passages” of the anodic current collector that are defined by the peaks of the anodic current collector. Blanchet notes that the positioning of the solid catalyst elements is advantageous because the elements are situated parallel to the axial flow direction of the fuel gas, providing enlarged free flow areas for the passage of gas. Although Applicants also dispose the catalyst in the anodic interconnect, the catalytic coating covers the entire surface area of the flow field. (Compare Applicants’ Fig. 3 with Blanchet’s Fig. 3). Thus, Applicants expose a significantly greater surface area of the catalyst to the fuel flow than does Blanchet.

Third, Applicants respectfully submit that a simple comparison of the devices of Blanchet and the claimed invention can provide instruction on the importance of providing the reforming catalyst as a coating in the Applicants’ claimed invention as compared to the solid catalyst element of Blanchet. The interconnect structure of Blanchet provides a solid catalyst configuration that reduces the volume of the flow field – effectively increasing the flow restriction to the fuel gas flow. The catalyst coating of

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Applicants' claimed invention, however, maximizes both the surface area of the catalyst available for interacting with the fuel gas and the volume of the flow field with very minimal flow restriction. As those of ordinary skill in the art would appreciate, a uniform flow field with minimal flow restriction is desirable to "achieve maximum fuel utilization and stack electrical efficiency." (Col. 1, Lines 48-58).

Even if the Examiner had established a *prima facie* case of obviousness, Applicants respectfully submit that Blanchet expressly teaches away from using anything other than solid catalyst elements that provide a "high transverse flow resistance." Blanchet teaches that restriction of the transverse gas flow within the current collector is advantageous. (See Col. 3, Lines 20-25). Blanchet notes that by loading the catalyst rod parallel to the gas flow, the transverse flow restriction is much higher than the axial flow restriction whereas in prior art devices the transverse flow restriction is nearly the same as the axial flow restriction. (Col. 7, Lines 21-33). By eliminating the solid catalyst elements in the claimed invention, however, Applicants also are eliminating the transverse flow restriction that Blanchet teaches is so desirable. Thus, one of ordinary skill in the art would not be inclined to use a catalyst coating on the interconnect surface in lieu of a solid catalyst element.

Moreover, modification of Blanchet to obtain Applicants' claimed invention would require significant and unreasonable experimentation – the formulation of the catalyst coating on the interconnects presents a significantly greater technical challenge than the formulation of a solid catalyst rod. Specifically, Applicants note that the presently claimed invention discloses a three-component catalyst coating formulation

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having a support material, a catalytic promoter, and a catalyst. (Claim 7). Suitable support materials, catalytic promoters and catalysts are delineated in the Specification as well as methods for the preparation and application of the coating to the metallic substrate. Whereas Blanchet discloses only that the internal reforming should be performed by “solid catalyst elements” and provides no teaching or suggestion of what would even constitute a suitable catalyst, the presently claimed invention expressly describes both how to make and use the catalytic coating. To obtain the catalytic coating of Applicants’ claimed invention from the “solid catalyst elements” in Blanchet would be unduly burdensome, and would require more than simple substitution of one element for another when Blanchet provides no teaching or guidance at all on what or how to prepare a catalyst to begin with.

Upon consideration of the entire record – including the prior art as a whole, the knowledge of those of ordinary skill in the art, the Applicants’ specification, and the arguments provided in response to the Examiner’s rejections – there is insufficient evidence to establish a *prima facie* case of obviousness by a preponderance of the evidence. The M.P.E.P. provides that:

The ultimate determination of patentability is based on the entire record, by a preponderance of evidence, with due consideration to the persuasiveness of any arguments and any secondary evidence. The legal standard of "a preponderance of evidence" requires the evidence to be more convincing than the evidence which is offered in opposition to it. With regard to rejections under 35 U.S.C. 103, the examiner must provide evidence which as a whole shows that the legal determination sought to be proved (i.e., the reference teachings establish a *prima facie* case of obviousness) is more probable than not.

(M.P.E.P. 2142 (emphasis added and internal citations omitted)).

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Not only does the prior art fail to remotely teach or suggest the claimed solid oxide fuel cells having internal reforming capabilities, but Applicants also have set forth why those of ordinary skill in the art would not modify the prior art of record to obtain Applicants' claimed invention. In light of the foregoing, Applicants respectfully submit that the prior art of record fails to render obvious the Applicants' claimed invention. The rejection must be withdrawn.

CONCLUSION

For the foregoing reasons, Applicants submit that the claims as amended are both novel and patentable over the cited prior art. Allowance of the pending amended claims is earnestly solicited.

If there are any issues which can be resolved by a telephone interview or with an examiner's amendment, the Examiner is invited to telephone the undersigned at 404.853.8012.

Respectfully submitted,

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